Syllabus for 4 Year Undergraduate Courses in Universities of Bihar

Based on N.E.P. 2020

Bachelor of Science, Physics

Prepared By :

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Physics

(A) Major Core Courses

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	I	MJC-1(T)	Introduction to Mathematical Physics & Classical Mechanics- (T)	4	100
		MJC-1 (P)	Introduction to Mathematical Physics & Classical Mechanics- (P)	2	100
2.	II	MJC-2 (T)	Oscillations& Waves (T)	4	100
		MJC-2 (P)	Oscillations& Waves (P)	2	100
3.	III	MJC-3 (T)	Thermal Physics & Thermodynamics (T)	3	100
		MJC-3 (P)	Thermal Physics & Thermodynamics (P)	2	100
4.		MJC-4 (T)	Electricity & Magnetism (T)	3	100
		MJC-4 (P)	Electricity & Magnetism (P)	1	100
5.	IV	MJC-5 (T)	Mathematical Physics and Introduction to Computational Methods (T)	3	100
		MJC-5 (P)	Mathematical Physics and Introduction to Computational Methods (P)	2	100
6.		MJC-6	Electrodynamics & Electromagnetism	5	100
7.		MJC-7 (T)	Optics (T)	3	100
		MJC-7 (P)	Optics (P)	2	
8.	V	MJC-8	Elements of Modem Physics	5	100
9.		MJC-9 (T)	Basic Electronics (T)	3	100
		MJC-9 (P)	Basic Electronics (P)	2	100
10.	VI	MJC-10	Analytical Mechanics & Special Theory of Relativity	4	100
11.		MJC-11	Statistical Mechanics	5	100
12.		MJC-12 (T)	Quantum Mechanics & its Application (T)	3	100
		MJC-12 (P)	Quantum Mechanics & its Application (P)	2	100
13.	VII	MJC-13 (T)	Physics of Atomsand Nuclei (T)	3	100
		MJC-13 (P)	Physics of Atoms and Nuclei (P)	2	100
14.		MJC-14	Research Methodology	5	100
15.		MJC-15 (T)	Solid State Physics (T)	4	100
		MJC-15 (P)	Solid State Physics (P)	2	100
16.	VIII	MJC-16 (T)	Molecular Spectroscopy and LASER: Principles& Applications (T)	3	100
		MJC-16 (P)	Physics of Molecules and Laser (P)	1	100

Sub Total = 80

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(A) Minor Courses to be offered by the Department for students of other Departments of Science

Sl. No.	Sem	Type ofCourse	Name ofCourse	Credits	Marks
1.	I	MIC-1	Introduction to Mathematical Physics & Classical Mechanics- (T)	2	100
		MIC-1	Introduction to Mathematical Physics & Classical Mechanics- (P)	1	100
2.		MIC-2	Oscillations & Waves (T)	2	100
		MIC-2	Oscillations & Waves (P)	1	100
3.	III	MIC-3 (T)	Thermal Physics & Thermodynamics (T)	2	100
			Thermal Physics & Thermodynamics (P)	1	100
4.	IV	MIC-4 (T)	Electricity & Magnetism (T)	2	100
		MIC-4 (P)	Electricity & Magnetism (P)	1	100
5.	V	MIC-5 (T)	Mathematical Physics and Introduction to Computational Methods (T)	2	100
		MIC-5 (P)	Mathematical Physics and Introduction to Computational Methods (P)	1	100
6.	V	MIC-6	Electrodynamics & Electromagnetism	3	100
7.	VI	MIC-7 (T)	Optics (T)	2	100
		MIC-7 (P)	Optics (P)	1	100
8.	VI	MIC-8	Elements of Modem Physics	3	100
9.	VII	MIC-9 (T)	Basic Electronics (T)	3	100
		MIC-9 (P)	Basic Electronics (P)	1	100
10.	VIII	MIC-10	Analytical Mechanics & Special Theory of Relativity	4	100

Sub Total = 32

(C) Multidisciplinary Courses to be offered

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	I	MDC-1	To be selected from the basket	3	100
2.	II	MDC-2	To be selected from the basket	3	100
3.	III	MDC-3	To be selected from the basket	3	100

Sub Total = 09

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(D) Ability Enhancement Courses to be offered

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	I	AEC-1	MIL	2	100
2.	II	AEC-2	Environmental Science	2	100
3.	III	AEC-3	Disaster Risk Management	2	100
4.	IV	AEC-4	NCC/NSS/NGOs/Social Service/ Scout and Guide/Sports	2	100

Sub Total = 08

(E) Skill Enhancement Courses to be offered

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	I	SEC-1	To be selected from the basket	3	100
2.	II	SEC-2	To be selected from the basket	3	100
3.	III	SEC-3	To be selected from the basket	3	100

Sub Total = 09

(F) Value Added Courses to be offered

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	I	VAC-1	To be selected from the basket	3	100
2.	II	VAC-2	To be selected from the basket	3	100

Sub Total = 06

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	v	INT-1	Summer Internship	4	100

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	VIII	RP-1	Research/Dissertation	12	100

Grand Total = 160 Credits

(G) Basket for Multidisciplinary Courses (MDC)

To be decided by Respective Department

(H) Basket for Skill Enhancement Courses (SEC)

See at the end of structure (this booklet)

(I) Basket for Value Added Courses (VAC)

See at the end of structure (this booklet)

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Question Paper Pattern

The question paper for end semester exam in theory paper will have following pattern-

1.Part A - Compulsory- Consisting of objective/Multiple choice type - each carrying two marks. 10x2= 20 marks

Part-B - Short answer type - Four questions are to be answered out of six questions. Each carrying five marks. 04x5 = 20 marks

Part- C - Long answer type questions. Three questions to be answered out of five Questions, each carrying ten marks. 03x10 = 30 marks

2. Examinations shall not be held on OMR Sheets .

(G) Basket for Multidisciplinary Courses (MDC)

Semester-I

Physics
• **Physics around us** • Basics of Medical Physics • Nano Science • Physics of Diagnostics

Semester-II

Physics
• Basic of Medical science • **Crystallography** • Environmental Physics • Engery Science • Measurement & Instrumentation

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(H) Basket for Skill Enhancement Courses (SEC)

Semester–I

Physics
• Advance Spreadsheet Tools • Basic IT Tolls • Creative Writing • Communication Everyday life • **Physics Workshop Skills**

Semester–II

Physics
• Big Data Analysis • Beginners Course to Calligraphy • Introduction to Cloud Computing (AWS) • Personality Development &Communication • **Web Development** • Computational Physics Skill

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(I) Basket for Value Added Courses (VAC)

Semester–I (VAC-1)

Physics
• Ayurveda & Nutrition • Financial Literacy • Ethic & Culture • Art of Being Happy • Swachh Bharat • Fit India • Pancha kosh : Holistic Development of Personality • Culture & Communication • **Work of Great Indian Scientists**

Semester–II (VAC-2)

Physics
• Vedic Mathematics • Emotional Intelligence • Yoga Philosophy & Practice • Ethics &Values in Ancient Indian Tradition • Constitutional Values & Fundamental Duties • Social & Emotional Learning • Ecology & Literature • Contribution of Indian Scientists since Independence • **History of Science**

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Programme Outcomes:-

At the completion of the programme, students will attain the ability to:

PO 1- Acquire a systematic and coherent understanding of the diversified academic fields of Physics through good understanding on various components of Physical Science.

PO 2-Solve & understand major concept in all disciplines of Physics.

PO 3-Apply his / her comprehensive Laboratory training in their Professional life.
PO 4-Employ Scientific knowledge and Critical thinking in their daily life.

PO 5-Employ their Scientific Temperament in the field of research and higher studies.
PO 6-Employ their knowledge in the studies of upcoming advance merging technology.

PO 7-Demonstrate relevant generic skills for global competencies like investigative skills related to various issue and problems, analytical skills with ability to construct logical arguments, ICT skills.
PO 8-Demonstrate professional behaviour & help to become – objective unbiased & truthful individual, potentially ethical in work -related situation.

Programme Specific Outcomes

At the completion of the program, students will attain the ability to:

PSO1: Develop strong competencies in Physics and its applications in a technology-rich, interactive environment.

PSO2: Link not only to the research in the area of theoretical but also to the area of experimental physics.

PSO3: Acquire skills in the numerical technique for modeling physical system & for analysis & interpretation of complex system

PSO4: Develop & understanding on the impact of Physics & Science on Society

PSO5: Evolve as better human resource with a solid foundation in theoretical and experimental aspects in respective specializations as a preparation for career in academia and industry.

PSO6: Apply knowledge gained from this programme for employment in several sectors including Electronics, Manufacturing and Teaching Sector
PSO7: Conceptual understanding of Physics to general real-world situation.

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Semester-I

Introduction to Mathematical Physics & Classical Mechanics
Major Course I (MJC-1)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Introduction to Mathematical Physics & Classical Mechanics	6	4	2

Course Outcomes

After completion of the course, the student will be able to-

CO 1-Understand various mathematical techniques used in Physical Problems. Know the difference between Newtonian Mechanics and Analytic Mechanics.

CO 2- Understand utility of scalars and vectors and their operations- algebraic and D-operator

CO 3- Understand the concept of Pseudo force and its importance with application in real life situations.

CO 4-Realize the idea of centre of Mass and Laboratory frame.

CO 5- Understand the orbit of communication and Remote sensing satellite.

MJC -1(T)-4 Credit

Unit I-Concept of Differentiation & Integration- **01 Credit (15 hrs)**

Differential calculus: Geometric Meaning of derivative; Maxima & Minima; Approximation of derivative; Partial Differentiation, Approximation using Taylor and Binomial series.

Integral Calculus: Geometric Meaning of integration, order and degree of differential equation, Solution of First order (homogeneous & Non-homogeneous), Integrating Factor, Exact and Inexact Differentials, D-operator & Solution of Second order Differential Equation.

Unit II-Vector Algebra &Vector Calculus- **01 Credit (15 hrs)**

Vector Triple Products & their significance; concept of scalar & vector fields, Gradient of scalar , Divergence & Curl of vectors and their physical applications in Physics (e.g. Equation of continuity , Euler's equation of motion, Bernoulli's theorem, Fourier heat flow, Poisson's and Laplace's equation in a gravitational field, Gauss's law of in Electrostatic, etc.).

Unit III- Fundamentals of Dynamics – **01 Credit (15 hrs)**

Inertial and Non-Inertial Frame of Reference, Rotating frame of Reference, Centrifugal and Coriolis Forces with their applications (Effect on value of 'g', On path of freely falling body, Geo- physical effect); Foucault pendulum, Direct proof of rotation of Earth.

Unit IV- Centre -of- Mass Frame and Central Forces **01 Credit (15 hrs)**

Lab frame & Centre of Mass frame, Two dimensional collision in physical problems, Relation connecting Scattering angle, Recoil angle, final velocities in C-frame & L-frame, Cross section & Rutherford scattering, Central forces and their equations,: General Equation of central orbit, Kepler's law of Planetary motion , Artificial satellite.

Suggested Books :

1. H. Goldstein, C. P. Poole and J. F. Safko, Classical Mechanics, Addison-Wesley
2. N. C. Rana and P. S. Joag, Classical Mechanics, Tata McGraw-Hill.
3. Classical mechanics- J.C. Upadhyay
4. Classical mechanics- A.B Gupta
5. Classical mechanics- Tackwale & Puranik
6. Mathematical Physics- Pipes **OR** W.W. Bell
7. Innovative Mathematical Physics—Prof B. C. Rai
8. S. L. Gupta, V. Kumar and H. V. Sharma, Classical Mechanics, PragatiPrakashan.
9. Differential Equations, George F. Simmons, 2006, Tata McGraw-Hill.
10. Mathematical Methods for Physicists, Arfken, Weber and Harris, Elsevier

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MJC -I(P)-2 Credit

The theory involved in the prescribed practical should be discussed in class and students should be made familiar with associated concepts.

At least 6 experiments must be performed-

1. Elementary measuring apparatus – Use of Vernier calliper, Screw guage and Spherometer.
2. To determine least Count of (i) Travelling Microscope (ii)Spectrometer (iii) Polarizer.
3. To Evaluate value of "g" using Bar Pendulum
4. To Evaluate value of "g" using Kater's Pendulum
5. To Verify Conservation of linear Momentum using curved track apparatus.
6. To Determine Young's modulus of Elasticity by Flexure of Beam
7. To Determine Elastic constants for the material of a wire by Searle's method
8. To Determine Surface Tension by method of ripples/use of Capillary tube
9. To Determine Co-efficient of Viscosity of liquid by Stokes method/Poiseuille's method of flow of water through Capillary.
10. To study the motion of spring-mass system and to evaluate spring constant/value of 'g'.
11. To evaluate average error, standard deviation, and percentage error in measurement of focal length of a concave mirror/Convex lens.

The CIA examination in Practical should be just as Mock test and it must be on the Pattern of proper 3hrs End- semester Examination.

Sl. No.	Component	CIA	End- Semester
1	Experiment Allotted	15	45
2	Continuous Pratical Record	05	10
3	Viva-Voce	10	15
		30	**70**
		Total = 100 Marks	

Suggested Books :

1. Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, 1971, Asia Publishing House
2. A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed., 2011, Kitab Mahal
3. Advanced level Physics Practical, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
4. A Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal, 1985, Vani Pub.
5. Properties of Matter- D. S. Mathur

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Introduction to Mathematical Physics & Classical Mechanics
Minor Course I (MIC-1)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Introduction to Mathematical Physics & Classical Mechanics	3	2	1

MIC -1 (T)-2 Credit

Introduction to Mathematical Physics & Classical Mechanics

Unit I-Introduction to Calculus & Vector **01 Credit (15 hrs)**

Differential calculus: Geometric Meaning of derivative; Maxima & Minima; Approximation of derivative; Partial Differentiation.

Integral Calculus: Geometric Meaning of integration, order and degree of differential equation, Solution of First order (homogeneous & Non-homogeneous), Integrating Factor, Exact and Inexact Differentials.

Recapitulation of Vectors, Vector Algebra involving two and three vectors, Introduction to Gradient, Divergence , Curl of Vectors with their physical significance.

Unit II-Fundamentals of Dynamics – **01 Credit (15 hrs)**

Inertial and Non-Inertial Frame of Reference, Rotating frame, Fictitious Forces-Centrifugal and Coriolis Forces with their applications (Effect on value of 'g', On path of freely falling body)

Introduction to special theory of relativity & its postulates

Suggested Books :

1. H. Goldstein, C. P. Poole and J. F. Safko, Classical Mechanics, Addison-Wesley
2. N. C. Rana and P. S. Joag, Classical Mechanics, Tata McGraw-Hill.
3. L. D. Landau and E. M. Lifshitz, Mechanics,Butterworth-Heinemann.
4. S. L. Gupta, V. Kumar and H. V. Sharma, Classical Mechanics, PragatiPrakashan.
5. R. D. Gregory, Classical Mechanics,Cambridge University Press.
6. Classical mechanics- J.C. Upadhyay
7. Classical mechanics-A.B Gupta

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MIC -I (P)-1 Credit

Introduction to Mathematical Physics & Classical Mechanics

The theory involved in the prescribed practical should be discussed in class and students should be made familiar with associated concepts.

1. Elementary measuring apparatus – Use of Vernier calliper, Screw guage and Spherometer.
2. To determine least Count of (i) Travelling Microscope (ii)Spectrometer (iii) Polarizer.
3. To Evaluate value of "g" using Bar Pendulum
4. To Evaluate value of "g" using Kater's Pendulum
5. To Verify Conservation of linear Momentum using curved track apparatus.
6. To Determine Young's modulus of Elasticity by Flexure of Beam
7. To Determine Elastic constants for the material of a wire by Searle's method
8. To Determine Surface Tension by method of ripples/use of Capillary tube
9. To Determine Co-efficient of Viscosity of liquid by Stokes method/Poiseuille's method of flow of water through Capillary.
10. To study the motion of spring-mass system and to evaluate spring constant/value of 'g'.

The CIA examination in Practical should be just as Mock test and it must be on the Pattern of proper 3hrs End- semester Examination.

Sl. No.	Component	CIA	End- Semester
1	Experiment Allotted	15	45
2	Continuous Pratical Record	05	10
3	Viva-Voce	10	15
		30	**70**
		Total = 100 Marks	

Suggested Books :

1. Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, 1971, Asia Publishing House
2. A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed., 2011, Kitab Mahal
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition
4. A Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal, 1985, Vani Pub.
5. Properties of Matter- D. S. Mathur

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Multidisciplinary Course (3 Credit)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Physics Around Us	3	3	0

Course Outcomes

After completion of the course, the student will be able to-

CO 1-Understand the physical laws governing climate and atmosphere
CO2- Explore the use of Physics in agriculture and its product Preservation.
CO3-Importance of Renewable energy and Physics behind its various harvested types.

Physics Around Us

UNIT **1** **01 Credit (15 hrs)**

Climate Science

Atmospheric science as multidisciplinary science, physical and dynamical metrology weather climate variables, and their difference. Surface weather station weather forecasting, Greenhouse effect, Physics of Climate change and Climate model

Unit 2 **01 Credit (15 hrs)**

Applications of Physics

Application in Agriculture,Agro Physics,Agro ecosystem,Soil Physics, Food preservation,Physics behind medical imaging, LASER –Surgery.

Unit 3 **01 Credit (15 hrs)**

Energy Sources- Importance of Renewable energy ; solar energy, hydro thermal energy, Geothermal Energy, Hydrogen based Fuel , CNG , Energy Harvesting

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Skill Development Course

Course Title	Credit	Credit Distribution	
		Theory	Practical
Physics Workshop Skill	3	1	2

Course Outcomes

After completion of the course, the student will be able to-
CO 1-Apply basic tools in Day-to-day applicaton

CO 2-Use acquired skills for detecting and correcting House hold electrical circuit and appliance

CO 3-Utilize acquired skills in market, as per the interest.

Physics Workshop Skill

Unit	Topics to be covered	Hours
1	**Introduction:** Measuring units. Conversion to SI and CGS unit. Familiarization with meter scale, Vernier calliper, Screw gauge Stop watch and Spherometer their utility. Measure the dimension of a solid block , thickness of metal sheet,. Archimedes Principle	15
	Practical (Hands on Training) **1.**To determine the height of a building using a Sextant **2.**Measurement of volume of a cylinder using vernier caliper. **3.** Measurement of diameter of thin wire using screw gauge, **4.**To learn working on Travelling Microscope. **5.** To determine the acceleration due to gravity using a simple pendulum. **6.**Use of Fuse & MCB in circuit **7.** Installing a new Plug. **8.** Use of multimeter / Soldering of electrical circuit. **9.** Repair an electric cord/ iron/ kettle. **10.** Study of Regulator power supply of a building.	30

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Value Added Course

Course Title	Credit	Credit Distribution	
		Theory	Project
Great Indian Scientists	3	2	1

Course Outcomes

After completion of the course, the student will be able to-

CO1-understand the importance of Scientific thinking and benefits of Consistant exploration.

CO2-recognize the benefits of consistent small efforts over cozy technological use

CO3-learn about contribution of Indian Scientist for national development and about Indian knowledge system.

CO4-realise the lead role of Indian Women in area of Science and Technology

Great Indian Scientists

Unit I **01 Credit (15 hrs)**

Life and work of Indian Scientists-I

Dr. C.V. Raman (Raman effect & Indian Academy of Science), Homi Jahangir Bhabha (Indian Nuclear Programme &Atomic Energy Commission), Sir Jagdish Chandra Bose (Radio-wave optics & Bose Institute), Dr. Vikram Sarabhai (Indian Space Program &Physical Research Laboratory) , Satendra Nath Bose (Bose Einstein work), Dr. Prafull Chandra Mahalanobis (Statistician, I.S.I)

Unit II **01 Credit (15 hrs)**

Life and work of Indian Scientists-II

M.G.K Menon (KGF Particle, TIFR), M.S. Swaminathan (Green Revolution, Agriculture Research), Shanti Swaroop Bhatnagar (colloid chemistry & CSIR), Bidhan Chandra Roy (National Doctor's Day) Verghese Kurien (White Revolution)

Unit III **01 Credit (15 hrs)**

Indian Women in Science

Janaki Ammal (Da Botanical Survey of India), Asima Chatterjee (Phyto Chemistry), Rajeshwari Chatterjee (1st Electrical & Communication energy Engineer), Dr. Kamale Solonie (1st Ph.D. holder), Anandi Bai Gopal Roy Joshi (1st Women Physician), Dr. Indra Hinduja (In-Vitro fertilisation)

NOTE:- *Students may undertake project on Scientific work of any Indian Scientist of their choice .*

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Semester-2
Major Course II (MJC-2)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Oscillations and Waves	6	4	2

Oscillations and Waves

Course Outcomes
After completion of the course, the student will be able to-
CO 1-understand the concept of Periodic and Oscillatory motion with application of free , Damped and Forced Oscillation in Physical Situation.
CO2-learn application of Lissajou Figure in different Physical Problems
CO3-explore the working of various Musical Instrument.
CO4-understand the Physics behind Accoustic of Building.
CO5-know the technique of sound Recording and Reproduction.

MJC -II(T)-4 Credit

Unit I :- Basics of Oscillations **01 Credit (15 hrs)**

Idea of S.H.M., its differential equation and solutions, Energy in S.H.M, Two body oscillation, coupled Pendulum: Normal modes of vibration, Compound Pendulum, Free, Damped and Forced Oscillations, Transient and steady states, Electrical Oscillations Resonance: Sharpness of Resonance and Quality factor.

Unit II :- Superposition of Oscillations **01 Credit (15 hrs)**

Addition of two S.H.Ms: Concept of Lissajou Figure, its Geometrical Composition & Application, Stationary waves as combination of oscillations (Waves in a linear bounded medium), Vibration of string and Sonometer .

Unit III :-Wave Motion **01 Credit (15 hrs)**

Wave front, Equation of Wave Motion, Superposion of two Harmonic waves : Interference, Beats & combination of tones, pressure, energy and intensity in wave propation, musical instruments.

Unit IV :- Sound Waves **01 Credit (15 hrs)**

Sound wave: Proparation and speed of sound (Accoustic) waves in media , speed in air : Newton's formula & Laplace Correction. Characteristics of Musical sounds & their analysis, Musical scale & consonance, Sound recording and reproduction, Accoustic of Buildings.

Suggested Books :

1. Waves & Oscillation- B. S. Agrawall .
2. Waves & Oscillation- Dongre & Bhattacharya
3. The Physics of Vibrations and Waves, H. J. Pain, John Wiley & Sons Ltd.
4. The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill
5. Waves and Oscillations, N Subrahmanyam, Brij Lal, Vikas Publishing House Pvt Ltd.
6. Theory of Vibration- W. T. Thomson
7. A Textbook of Sound- D.R. Khanna & R.S Bed.

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MJC -II (P)-2 Credit

Oscillations and Waves

The theory involved in the prescribed practical should be discussed in class and students should be made familiar with associated concepts.

At least 6 experiments must be performed:-

1- To determine frequency of Tuning Fork using Sonometer / verify laws of transverse vibration of stretched string
2- To determine frequency of Tuning Fork using Electrically maintained Melde's apparatus.
3- To determine the frequency of A. C. Mains using a sonometer and an electromagnet.
4- To Find the Speed of sound in the materials of given rod with a Kundt's tube / Quincke's tube.
5- To determine Speed of Ultrasonic waves in any given liquid (e.g. Kerosene)
6- To study motion of Spring – Mass System.
7- To study the directional characteristic of Microphone using signal Generator, Amplifier, microphone, multimedia & C. R. O.
8- To determine the damping constant , relaxation time and quality factor of damped mechanical oscillator using simple Pendulum with bobs of different material (Aluminium , Brass, Wood etc.)
9- To determine torsional constant using Torsional Pendulum.
10- To determine speed of sound using Resonance column Apparatus.

The CIA examination in Practical should be just as Mock test and it must be on the Pattern of proper 3hrs End- semester Examination.

Sl. No.	Component	CIA	End- Semester
1	Experiment Allotted	15	45
2	Continuous Pratical Record	05	10
3	Viva-Voce	10	15
		30	**70**
		Total = 100 Marks	

Suggested Books :

1. Advanced Practical Physics for students, B. L. Flint and H. T. Worsnop, 1971, Asia Publishing House.
2. Engineering Practical Physics, S. Panigrahi & B. Mallick, 2015, Cengage Learning India Pvt. Ltd.
3. Practical Physics, G. L. Squires, 2015, 4/e, Cambridge University Press.
4. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11/e, 2011, Kitab Mahal.

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Minor Course II (MIC-2)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Oscillations and Waves	3	2	1

MIC -II (T)-2 Credit

Oscillations and Waves

Course Outcomes

After completion of the course, the student will be able to-

CO 1-understand the concept of Periodic and Oscillatory motion with application of free , Damped and Forced Oscillation in Physical Situation.

CO2-learn application of Lissajou Figure in different Physical Problems

CO3-explore the working of various Musical Instrument.

CO4-understand the Physics behind Acoustics of Building.

CO5-know the technique of sound Recording and Reproduction

Unit I :- **01 Credit (15 hrs)**

Idea of S.H.M, Free, Damped & Forced Oscillation, Superpostion of two collinear and Perpendicular Simple Harmonic motion, Concept of Lissajou Figure & Stationary Waves.

Unit – II :- **01 Credit (15 hrs)**

Waves Characteristic of Wave Motion, Sound Wave, Equation of Plane Progressive Waves, Speed of sound (Newton's & Laplace Formula), Energy Transport & Intensity of Waves.

Suggested Books :

1. The Physics of Vibrations and Waves, H. J. Pain, john Wiley & Sons Ltd.
2. The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill
3. Waves and Oscillations, N Subrahmanyam, Brij Lal, Vikas Publishing House Pvt Ltd.
4. Waves & Oscillation – B.S. Agrawall
5. Waves & Oscillation – A.B Gupta

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MIC -II (P)-2 Credit

Oscillations and Waves

The theory involved in the prescribed practical should be discussed in class and students should be made familiar with associated concepts.

At least 6 experiments must be performed:-

1- To determine frequency of Tuning Fork Using Sonometer / verify laws of transverse vibration of stretched string
2- To determine frequency of Tuning Fork using Electrically maintained Melde's apparatus.
3- To determine the frequency of A. C. Mains using a sonometer and an electromagnet.
4- To find the speed of sound in the materials of given rod with a Kundt's tube / Quincke's tube.
5- To determine speed of ultrasonic waves in a given liquid (e.g. Kerosene)
6- To study motion of spring – mass system and find g.
7- To study the directional characteristic of Microphone using signal Generator, Amplifier, microphone, multimedia & C. R. O.
8- To determine the damping constant, relaxation time and quality factor of damped simple pendulum with bobs of different material (Aluminum, Brass, Wood, etc.)
9- To determine torsional constant using a Torsional Pendulum.
10- To determine speed of sound using Resonance column Apparatus.

The CIA examination in Practical should be just as Mock test and it must be on the Pattern of proper 3hrs End- semester Examination.

Sl. No.	Component	CIA	End- Semester
1	Experiment Allotted	15	45
2	Continuous Pratical Record	05	10
3	Viva-Voce	10	15
		30	**70**
		Total = 100 Marks	

Suggested Books:

1. Advanced Practical Physics for students, B. L. Flint and H. T. Worsnop, 1971, Asia Publishing House.
2. Engineering Practical Physics, S. Panigrahi& B. Mallick, 2015, Cengage Learning India Pvt. Ltd.
3. Practical Physics, G. L. Squires, 2015, 4/e, Cambridge University Press.
4. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11/e, 2011, Kitab Mahal.

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Multidisciplinary Course (3 Credit)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Crystallography	3	3	0

(03 Credit)

Course Outcomes

After completion of the course, the student will be able to-

CO 1-understand the structure of various crystal

CO2- know the theoretical framework like symmetry and space groups

CO3-know characterization of crystal using diffraction technique

CO4-know the analysis of collected diffraction data

Crystallography

Unit 1 **01 Credit (15 hrs)**

Elements of Crystallography

Unit cell,Lattice and Basis , Symmetry operation for a two dimensional crystal , Two and Three dimensional Bravais lattice. Reciprocal lattice, Lattice constant crystal plane and Miller indices, Inter plannar spacing, Simple crystal structure - hcp ,fcc, bcc SC diamond and Cesium Chloride Structure.

Unit II **01 Credit (15 hrs)**

Crystal Type and Crystal Binding

Ionic Crystal. Covalent crystal, Metal crystal, Molecular crystal. Hydrogen bonded crystal ,Calculation of BE in different type of crystals, Crystal of in inert gases.

Unit III **01 Credit (15 hrs)**

XRay Diffraction

Diffraction , Braggs law , Diffraction methods , Scattering by electrons , atoms. Laue , Bragg and Ewald Work on X- ray diffraction, Indexing of X-ray diffraction

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Skill Development Course (03 Credit)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Web Development	3	1	2

Course Outcomes

After completion of the course, the student will be able to-

CO1: Simple and impressive design techniques, from basics till advanced to focus on goal oriented and user centric designs.

CO2: How to and where to start research, planning for website & actually build excellent web sites.

CO3: To create web elements like buttons, text boxes and various UI designs.

CO4: Forms and validations for website. Setting up page layout, color schemes etc. in the designs.

Web Development

Unit	Topics to be covered	Hours
1	**Concept of Web Development:** A brief Introduction to the Web Development: Computer Networks, Internet, URL (Uniform Resource Locator), Internet Service Provider, Intranet, Extranet, Various Components of Web Development, Static v/s Dynamic Web pages, Introduction to HTML, CSS and Javascript	15
	Practical	
1	**Basics of HTML:** What is Internet Language? Understanding HTML, create a Web page, linking to other WebPages, Publishing HTML Pages, Text Alignment and Lists, Text Formatting Fonts Control, External Links and link within a Page, creating a Table, Creating HTML Forms, Custom Backgrounds and Colors.	10

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2	**Dynamic Webpage Development** **Cascading Style Sheet:** CSS, Defining Style with HTML Tags, Features of StyleSheet, Style Properties, Style Classes, External Style Sheet	10
3	**JavaScript** Introduction to JavaScript: Writing First Java Script, External Java Script, Variables: Rules forvariable names, Declaring the variable, assign a value to a variable, Scope of variable, Using Operators, Control Statements, JavaScript loops, JavaScript Functions: Defining a Function, returning value from function, User define function.	10

Reference:

1. AlamTanweer(2010), Web Designing and Development, Khanna Book Publishing, New Delhi
2. DeepaSonalet. Al.(2021), A trip to Web Designing: HTML, CSS and Javascript, InSc International Publication
3. Jennifer Kyrninet. al. (2023) Mastering HTML, CSS & Javascript Web Publishing, BPB Publication.

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Value Added Course (03 Credit)

Course Title	Credit	Credit Distribution	
		Theory	Project
History Of Science	3	2	1

Course Outcomes
After completion of the course, the student will be able to-

CO 1-understand the origin of science and the correlation between "Cause" & "Effect"

CO2-understand the contribution of Indian Scientists in area of Atomic Energy, Dairy Technology, Agriculture etc.

CO3-understand the legacy of ancient Indian Science.

CO4-understand the Indian calendar system and vedic mathematical calculations

Unit 1 **01 Credit (15 hrs)**

History of Science-

Origin and outline of historiography of science, Ancient Indian science from Vedic age to pre-independence Era, Indian contribution to Technology.

Unit 2 **01 Credit (15 hrs)**

Science in Post Independence era

Development of science In post Independence era, Indian contribution to Science and Technology in the field of Atomic energy ,Dairy technology, Agriculture, Bio-Technology.

Unit 3 **01 Credit (15 hrs)**

Astronomy

Ancient Astronomy, Vedic Astronomy, Modern Astronomy, Tools for Astronomy from early period, Indian Calender System, Computation of Eclipse, Lunar Eclipse ,Solar Eclipse;Full moon.

NOTE:- ***Student must undertake a project on science in ancient India.***

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